

Rainwater Harvesting for Agriculture and Water Supply

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 Science Press
Beijing

 Springer

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Additional material to this book can be downloaded from <http://extras.springer.com>.

ISBN 978-981-287-962-2 ISBN 978-981-287-964-6 (eBook)
DOI 10.1007/978-981-287-964-6

Jointly published with Science Press, Beijing
ISBN: 978-7-03-045705-9 Science Press, Beijing

Library of Congress Control Number: 2015951756

Springer Singapore Heidelberg New York Dordrecht London

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Printed on acid-free paper

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(www.springer.com)

Preface

China in common with most other countries around the world is facing unprecedented challenges due to the growing demands on its water resources. The problem faced is how to manage these sustainably so they meet both the needs of a rapidly developing nation today, while also providing for generations to come. One major part of this challenge involves how to carefully manage ground and surface water resources to protect them from overexploitation and pollution through promoting water conservation, recycling, and reuse of urban and industrial water supplies. An equally important part is how to provide improved water supplies to meet the increasing demands from agriculture and the needs and growing aspirations of rural populations. A failure to meet the needs of the rural populations in developing nations will simply lead to millions more remaining in impoverished conditions or joining the flood of poor rural migrants moving into new megacities. This will put even greater pressure on their water supplies, wastewater systems, and other infrastructure if the urbanization is not managed properly.

While most developing countries are struggling with these problems, in the realm of rural development China has made great strides. Since the 1980s, hundreds of millions of rural people have been lifted out of extreme poverty and had their livelihoods improved. This achievement has of course been the result of numerous different projects and interventions. One particularly successful intervention, which is the focus of this book is the promotion and widespread implementation of rainwater harvesting (RWH) across the loess plateau in Gansu and from there to other provinces across China. The new improved rainwater supplies, initially provided a lifeline to communities which were desperately short of water, but over time the careful utilization of the stored rainwater, in conjunction with low rate irrigation (LORI) methods and use of greenhouses, led to significant improvements in the livelihoods of individuals and the rural economy as a whole. In addition to providing food and water security, using RWH and LORI systems farmers have been able to grow a far greater range of produce which has led to greatly improved diet and opportunities in the market. By 2007, at least 22 million people across China were using rainwater supplies as their main water source for domestic use. In addition, 2.8 million hectare of farmland was using RWH for

supplementary irrigation, leading to crop yield increases averaging 40 %. RWH has also played an important role in soil and water conservation in semi-arid regions along with the construction of terraces, contour bunds, and microcatchments. This has assisted in the re-vegetation and ecological restoration of large swathes of previously degraded land and helped reduce soil erosion and flood hazards. In China, RWH has become an important alternative to conventional water resources and a key to fostering sustainable development and environmental restoration especially in areas facing water scarcity.

Internationally, over the past few decades there has been a growing interest in RWH for improving domestic water supplies, for small-scale irrigation and for environmental conservation. In some countries, RWH has had a significant impact on rural food and water security, but with over a billion people across the developing world still lacking access to either safe convenient water supply or adequate food, much still needs to be done.

In order to share China's positive experiences and to help promote RWH worldwide, since 2003 the China Ministry of Commerce has been supporting an International Training Course on RWH and Utilization for Developing Countries for the professional development of participants working in the field of water resources and agriculture in developing countries. Course sponsors have also included the Ministry of Water Resources, the Gansu Provincial Government, and UNESCO. The Gansu Bureau of Water Resources (GBWR) and the Gansu Research Institute for Water Conservancy (GRIWAC) are in the responsibility of organization of the course. They have provided experts who in cooperation with a number of international RWH specialists with links to the International Rainwater Catchment System Association (IRCSA) and other agencies have been delivering the course. To date, over 848 International participants from over 81 countries have taken part in the course. This book has evolved out of the material used for the training course and is intended to provide a practical background reader for practitioners and others with an interest in RWH.

The purpose of this book is to present some of the key resource material developed for the training course with a particular focus on the RWH program in China, and international experience relating to RWH for water supply and agriculture with an emphasis on rural areas from across the developing world. The first six chapters focus on the development of RWH in the arid province of Gansu, China and cover the design, construction, operation, and management of systems developed over the past three decades for both domestic use and irrigation. The final five chapters include a global overview of RWH with chapters covering topics including roof water harvesting in the tropics, rainwater quality issues, and runoff farming. While most of the content deals with RWH for arid and semi-arid contexts, some of the material in these chapters is universally relevant and will be of use to those in more humid areas.

A great debt of gratitude is afforded to all the sponsors, lecturers, and participants for their contribution to the training course and a special acknowledgment afforded to all those who have contributed to this publication. It should be noted that the ideas and views expressed in this book represent those of the authors and

not necessarily those of the editors or the organizations they represent. Thanks are also due to Ms. Xiaojuan Tang of GRIWAC, who has checked the style and format of the manuscript. Special thanks are due to Ms. Becky Zhao, Ms. Abbey Xiaojin Huang and Jenna Mengyuan Zhou of Springer Beijing and Ms. Xiuwei Li of China Science Press for their constructive comments on improving the manuscript and kind assistance in enabling this book to be published.

The editors would appreciate any feedback and comments to the material presented in this book, please send these to GRIWAC (gssk@163.com, machengxiang@hotmail.com).

July 2015

John Gould
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